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Letter to the Editor

Finnish Sauna and COVID-19

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Dear Editor

Over the last 11 months, coronavirus disease 2019 (COVID-19) (caused by severe acute respiratory syndrome coronavirus 2, SARS CoV-2) has had devastating effects on the world, with substantial morbidity and mortality. In a desperate search to find effective preventive and curative therapies for COVID-19, several recommendations entered the spotlight. Some preventive measures that were proposed included vitamins D and C supplementation [1, 2], given their ability to enhance innate immunity. There have been anecdotal reports that exposing oneself to high temperatures can prevent COVID-19. During the summer, many countries witnessed a decrease in transmission of COVID-19 as well as decreases in severe illness and deaths associated with the disease.

This letter was driven by the fact that our research group has been inundated with numerous enquiries on whether heat exposure from saunas may be effective in combating COVID-19. Our primary research focus has been the role of passive heat therapy (using Finnish sauna) in the prevention of cardiovascular disease (CVD) and other non-communicable diseases [3]. Evidence suggests that high temperatures can reduce the transmission of influenza and the severe acute respiratory syndrome (SARS) viruses, as well as COVID-19 virus [4-6].

SARS-CoV-2 is the seventh member of the family of coronaviruses that infect humans. The coronaviruses are enveloped viruses which can remain active in cool dry conditions, but are destroyed by temperatures tolerable to humans; it has been shown that temperatures ranging from 60 to 80°C for 30 to 1 min duration respectively could inactivate the coronaviruses [7].

In a study that evaluated the stability of the virus in different environmental conditions, Chin and colleagues demonstrated that SARS-CoV-2 was highly stable at 4°C, but sensitive to heat [8]. In virus media incubated for 14 days, infectivity of the virus was still

high at a temperature of 4°C on day 14, whereas when the incubation temperature was increased to 70°C, the virus was inactivated within 5 mins. In a multicity study conducted in China to determine the impact of meteorological factors on COVID-19 transmission, it was observed that weather conditions associated with low temperature, mild diurnal temperature range and low humidity, were more likely to favour the transmission of COVID-19 [4].

Passive heat therapy is characterized by exposure to a high environmental temperature for a brief period. Though there are several forms of passive heat therapy, such as repeated hot water immersion, waon therapy, Turkish baths, Russian sauna, and infrared sauna; the Finnish saunas are regarded as the traditional saunas and are the most widely studied till date. Finnish saunas are characterized by high temperatures (ranging from 80-100 °C) and relative humidity varying from 10-20% (**Table**). Typical sauna sessions consist of short stays in the sauna interspersed with cooling-off periods. The duration of stay during a typical sauna session usually ranges from 5-20 minutes. We have shown in numerous reports that frequent sauna sessions can reduce the risk of hypertension, cardiovascular disease, dementia and even death [3]. So what is the link between Finnish saunas and COVID-19 prevention? During a sauna session, there is an increase in body temperature, which causes more efficient skin blood flow; the skin temperature increases to 40-42°C after about 10 minutes in the sauna and the core body temperature ranges between 37-38°C. Considering the overall evidence, the body temperatures reached during a sauna session are not high enough to kill or inactivate the virus should there have been a prior exposure to the virus.

However, sauna sessions may play a potential role in reducing the risk of severe COVID-19 for the following plausible reasons. In the report by Chin and colleagues on the stability of SARS-CoV-2 at various temperatures, it was shown that the virus was inactivated on day 2 at a temperature of 37°C, with inactivation being reduced to 30 mins at 56°C [8]. The evidence convincingly shows that the virus is very sensitive to heat and its infectivity is

reduced at higher temperatures. The findings of Liu and colleagues suggest that warmer weather might reduce the transmission of COVID-19 [4]. These observations are consistent with reports which suggest that the ability of the SARS and influenza viruses to spread are reduced with increasing temperatures [5, 6]. Furthermore, there is evidence showing wide variation in mortality rates from COVID-19 between various countries; while this observation may arise from different preventive efforts adopted by various countries, the discrepancy is huge when comparing countries in the Southern hemisphere to those in the Northern hemisphere. In a recent Editorial, Rhodes and colleagues noted that countries lying below latitude 35 degrees North had relatively low mortality rates [9]. Though the authors attributed this discrepancy to a possible role of vitamin D, there is a possibility that the high diurnal temperatures in these regions may be playing a role in the severity of COVID-19. In another study that investigated the impact of weather conditions, heat and humidity on the incidence and mortality of COVID-19 pandemic in various regions of Africa, it was demonstrated that an increase in relative humidity and temperature was associated with a decrease in the number of daily cases and deaths [10]. The overall evidence suggests that frequent Finnish sauna sessions may have the potential to prevent severe COVID-19 if not prevent it. Furthermore, regular sauna bathing has traditionally been used as a method of “hardening,” which means enhancing the body’s resistance. Like vitamin D, frequent sauna sessions have been shown to boost the immune system and reduce the risk of infections, such as common colds and pneumonia [3]. Whole body hyperthermia further enhances the immune system by inducing heat-stress that mimics the effects of fever. Finally, sauna exposure reduces systemic inflammation [3], which may have a role in predicting severe COVID-19.

Regular sauna sessions may play a potential role in reducing the risk of severe COVID-19, but well-designed interventional are needed to test this hypothesis. Having

117 regular sauna baths can improve overall health, enhance immunity and prevent the risk of
118 infections. Communal saunas should be avoided as this can facilitate the transmission of the
119 virus.

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148 **TABLE** Passive heat therapies

Type	Temperature, °C	Humidity, %
Finnish sauna	80-100	10-20
Russian sauna (sanarium)	50-60	40-70
Hammam (steam bath)	40-50	100
Infrared sauna	30-40	0

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